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No. III.

FLOORS AND TIMBERS FOR LARGE SHIPS.

The Gold Isis Medal *was presented to* John Wilson Green, *Esq., of Liverpool, for his Improved Floors and Timbers for Large Ships. Models illustrative of the same have been placed in the Society's Repository.*

The lengths of floor-timbers and of futtock-timbers in large ships, and the mode of putting them together so as to unite strength with economy, have obtained much attention of late years. In ships built in His Majesty's yards, in particular, the timbers are now much shorter than they used to be, and thereby more easily procured, and the ship is equally strong. Notwithstanding, however, I think the present mode of framing large ships not to be so complete, in point of strength, as the quantity of timber used therein will effect.

It is obvious, from fig. 6, which is an expansion of the common framing, *c* being the keel, that at four distinct heights between the keel and lower gun-port, the frame has only every other timber to unite the upper and lower parts together; the upper of these heights is at or near the load water-line, or point of oscillation, and has to sustain the forces of the upper part of the ship, when pressed on one side by the sails, and the counter action of the immersed part to regain its perpendicular position. This part of a ship's frame should, therefore, possess a strength of construction at least equal to any other part, having a greater strain imposed on it; and that it is the weakest, arises from a want of uniformity of strength throughout the frame.

If, in the second case, a ship be supposed driven on shore, her safety depends on the lower part of the frame, which, in the present construction, is less calculated to bear the weight, precisely in that part where it should be the most complete; for on the keel are as many joints as timbers, every other timber only uniting the two sides together; and a like deficiency occurs at the floor-heads, where every other futtock only supports the ship, in consequence of having only one timber between two butts: the floor-timbers are likewise weakened, and exposed to greater strain, by their extremities extending to the bearing of the ship. I shall here beg leave briefly to mention, that after many diligent examinations in surveying and repairing broken ships at Liverpool, to complete an inquiry into the cause of some ships being more broken than others when similarly situated, and where and how a ship sustains the greatest injury, I invariably found, that ships with the longest floor-timbers were most broken; the cause of which I apprehend to be, that on account of the length of the floors, the ship, when aground, rests on the floor-heads: in this situation, the seat of the floor on the keel being the fulcrum, the pressure of the higher side of the ship on them increases the leverage, and the floors are invariably broken. When floors are broken, a ship will seldom float, from this cause,— that the section of the bilge of the side being forced more out, the first futtocks are exposed to greater pressure, the treenails are strained, and the seams opened.

It was the investigation of the probable result of a differently-constructed frame, combining superior strength in both cases, which has enabled me to lay before the Society of Arts a plan, new and original, effecting economy in the conversion of timber, and giving considerably greater strength to the frame, by the introduction of two timbers between two butts (the common plan having only one), and more floor-timbers on the keel; consequently, the whole frame is better united.

Plans accompany this paper, expanding the frame of a three gun-deck ship, and of a large East Indiaman, to describe the advantages of the proposed plan in the first case; and plans, with models to represent the side midship frame, with the floors of a frigate, illustrative of the second case, which I shall proceed to explain, as they form the base of the proposed construction.

Let fig. 5 represent a floor-timber, shortened at one end from the seat, which will bring the greatest thickness of the floor to the large end of the tree, thereby shortening the timber, and effecting a saving in the measurement and conversion, (which saving is evident by comparing with the above fig. 4, which shews the wood cut away in converting a tree into a common floor-timber). Two floors so formed, *a b*, fig. 1, I place side to side on the keel, bolted and coaked together, as shewn in fig. 2, the long and short arms being reversed, to couple with the upper futtocks; next to these I introduce a first futtock, and again two floors, as shewn in the expansion fig. 3; a saving is thus effected on an average of five feet in every floor-timber of the three classes of ships above mentioned. But it is in reference to the increased strength that I submit the proposed construction, as it is sufficient for my purpose to obtain a stronger ship at the same expense. On the question, therefore, of strength, no other means (with the same scantling) can be adopted to save the present floor, than by cutting the ends short of the part where the ship takes the ground.

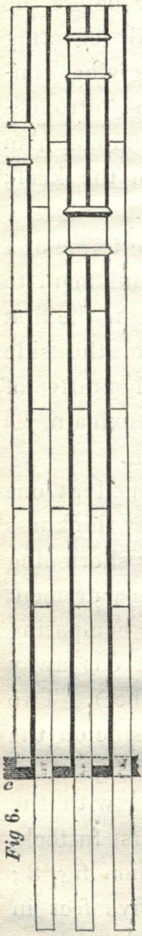


Fig 6.

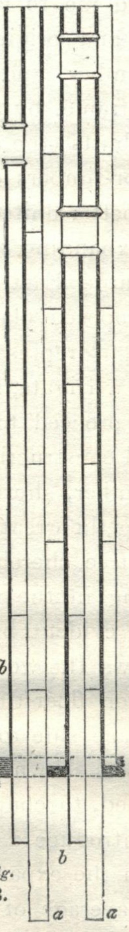


Fig. 3.

Fig. 1.

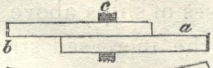


Fig. 2.

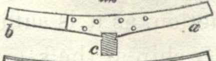


Fig. 4.

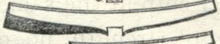
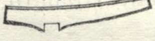


Fig. 5.



The formation of the proposed floors, and their being fastened to each other, strengthen the fulcrum and shorten the lever. Now it is well known, that if the cause of deflection be reduced, the tree is strengthened; and on this principle the proposed floors are constructed, being formed of two trees whose sides are continued and doubled together, making a scarph half the length of the whole, without reducing either tree, thereby having twice the substance at the fulcrum. To obtain a more practical result on the comparative strength of the present and proposed floors, I exposed three ribs of oak, from the same timber, cut, by an inch scale, to the length and thickness of the floor at present in use; one end was fixed, the seat was the fulcrum, and a weight was suspended at the other end; they nearly sustained the same weight, each having broke with 409 lbs. I exposed also, in like manner, pieces of oak cut from the same timber as the former, by the same scale, and fastened together, representing three of the floors proposed in this paper. One broke with 492lbs.; the second and third, being better fastened, broke, one with 512lbs., the other with 528lbs.; and if the pieces representing the proposed floors could have been further strengthened at the scarph, as they would be in a ship by the keelson and inside and outside plank, they would have borne a pressure equal to 667lbs. Taking, however, 409lbs. in one case, and 512lbs. in the other, the proposed floor is in point of strength as 5 to 4. These experiments also shew, that when a ship rests on her bilge, the pressure on one end of the proposed floor cannot part or strain the scarph, but that the long arm of the floor will give way, while the short arm remains unmoved.

The increased strength gained by the proposed construction, at the same expense and scantling, is thus obtained by bringing more timbers in contact with the pressure at those points on which the forces more particularly act; for instance, at the load water-line one half the timbers are positive, the other negative or neuter, in the present ship, while in the proposed construction every third timber only is negative.

The plan here suggested may be introduced in the body of a ship, so far forward and aft as to take the fore and main rigging, which in sharp ships is sufficient, because, in the proposed construction, the room and space is at the joint of the floors, and consequently further apart, but will fall into the present room and space at each end of the ship, which, being near is better suited for laying off.

Fig. 7.

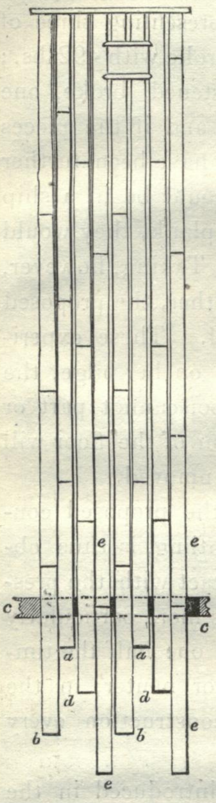


Fig. 7 shews a still more recent modification of Mr. Green's plan, according to which he places three floors between two butts of the first futtock-heels, and three timbers between two butts throughout the whole frame. *a b* are the alternating or unequal floor-timbers, *c c* the keel, *d* the equal or common floor-timbers, *e e* the first futtocks.